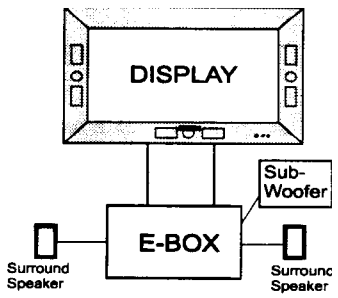
Colour Television **First Line**

FTV1.5E
AA

Service
Service
Service



Service Manual

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PHILIPS

1 Introduction/Technical data

1.1 Introduction

1.1.1 General

The Flat-TV is compared with the current range of products a complete new product.

A service policy has been defined for the dealer to serve the Customer's needs. In this First Line Manual the dealer is explained how to repair the Flat-TV.

Explanation functioning 42" Plasma Display Panel (pdp)

The plasma display panel consists of 2 glass-plates with in between a matrix configured electrode structure, a gas and 3 phosphors-coatings (red, green, blue).

At the back of the display the row- and column-drivers and additional electronics are positioned.

The input to the panel are three digital 8 bit signals for each colour and synchronisation signals.

The 42" wide screen display consists of 852x3 columns and 480 rows. One cell (1.08x1.08 mm) consists of a red, a green and a blue phosphor (0.36x1.08 mm.

The pdp is an emissive panel, so not a light-modulator as an LCD. The pdp dissipates on average about 300 Watts; the viewing angle is 160°.

The light making process happens as follows:

A cell is 'on' or 'off'.

Light-modulation is done by means of cycles having different sustain periods, sub frames.

If a cell is addressed to make light, electrical signals activate a plasma between the electrodes which generates UV light. This UV light activates the phosphor to enlighten.

To give the cells different luminance during a frame (one complete picture), this frame is subdivided in 8 sequential sub-frames. The duration of the sub-frames could be seen as digitising the analogue video. (So more video amplitude means more luminance, more light). The cell will be addressed 'on' for a longer time. The integration of this 'on'-times is perceived as amount of light. The weight factors of the different sub frames are chosen as a compromise between movement artifacts and flicker.

1.2 Technical data

Display

- Visible diagonal: 42"
- Display type: AC-Plasma
- Number of pixels: 852 (*3)*480
- Aspect ratio: 16:9

1.2.2 Sound

- Sound system: 15 speaker HIFI-stereo
- Dolby Prologic L.R.C.S.
- Graphics equalizer
- Loudspeakers: 6*65x135 mm squeeter, 3*14 mm tweeters surround 4*4"
- Subwoofer (external): 2*5"
- Output (total): 120 W continuous RMS

Frequency response: 20 Hz - 20 kHz +/-3 dB

1.2.3 Reception

- Tuning system: 100 fold PLL
- Colour transmission system:
  -/12 PAL BG, SECAM BGL, NTSC 4.43
  -/19 PAL BGLI, SECAM BGLL'
- Channel selections: VHF, UHF, S-Channels, Hyperband
- Frequency range: 47.25 - 855.25 MHz
- VCR pre-selection: All inputs
- Aerial input: 75 Ohm (Coax)

1.2.4 Miscellaneous

- Ambient temperature: +0/+45 degrees C
- Maximum operating altitude: 2000 m
- Mains: AC 110 - 240 V
- Power consumption: around 450 W
- Stand by consumption: 2 W
- Weight display: 45 kg
- Weight e-box: 18 kg
- Dimensions display (w*h*d): 118.5x75x11.5 cm
- Dimensions e-box (w*h*d): 43.5x25x41 cm

2 Connections

2.1 Front connections e-box

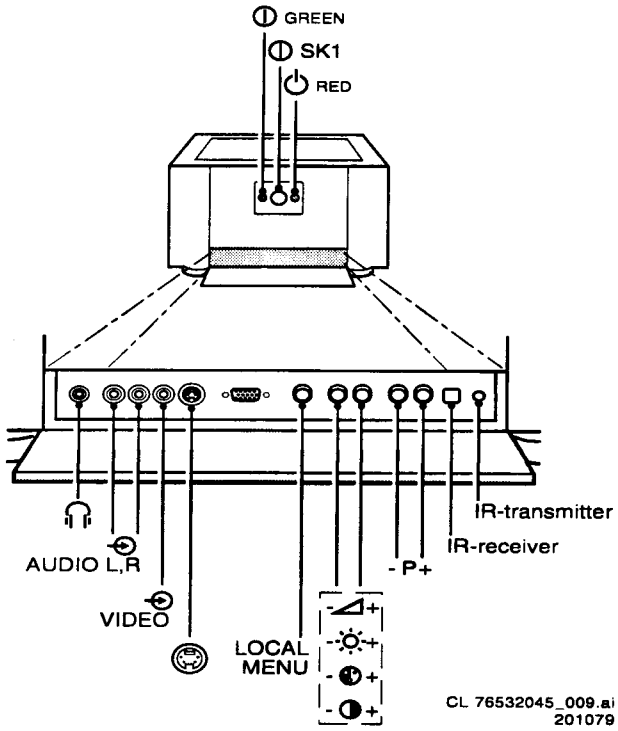


Figure 2-1

2.1.1 *Audio/Video*

-	Video	1Vpp/75Ω	◎
-	Audio	L(0.5Vrms ≥10kΩ)	◎
-	Audio	R(0.5Vrms ≥10kΩ)	◎
-	Headphone	(32-600Ω ≥10mW)	🎧

2.1.2 *SVHS*

2-			⊥
3-	Y	(1Vpp; 75Ω)	⊙
4-	C	(0.3 Vpp;75Ω)	⊙

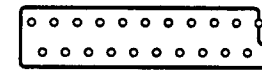
2.1.3 *VGA-in*

1-	Red	(0.7Vpp/75Ω)	
2-	Green	(0.7Vpp/75Ω)	
3-	Blue	(0.7Vpp/75Ω)	
4-			
5-			
6-	R		⊥
7-	G		⊥
8-	B		⊥
9-			
10-			⊥
11-			
12-			
13	-Hsync		
14-	Vsync		
15-			

2.2 Rear connections e-box/Connections set level

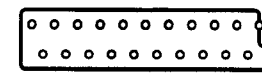
See figure 2.2

2.2.1 *EXT1(in/out): RGB+CVBS*



1-	Audio	R (0.5Vrms ≤1kΩ)	⊙→
2-	Audio	R (0.5Vrms ≥10kΩ)	⊙
3-	Audio	L (0.5Vrms ≤1kΩ)	⊙→
4-	Audio		⊥
5-	Blue		⊥
6-	Audio	L (0.5Vrms ≥10kΩ)	⊙
7-	Blue	(0.7Vpp/75Ω)	
8-	CVBS-status	0-1.3V:INT	
		4.5-7V:EXT 16:9	
		9.5-12V:EXT 4:3	⊙
9-	Green		⊥
10-			
11-	Green	(0.7Vpp/75Ω)	
12-			
13-	Red		⊥
14-	RGB-status		⊥
15-	Red	(0.7Vpp/75Ω)	
16-	RGB-status	(0-0.4V:INT	
		1-3V:EXT/75Ω)	
17-	CVBS		⊥
18-	CVBS		⊥
19-	CVBS	(1Vpp/75Ω)	⊙→
20-	CVBS	(1Vpp/75Ω)	⊙
21-	Earth socket		

2.2.2 *EXT2(in/out): SVHS+RGB+CVBS (intended for VCR.)*

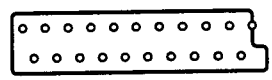


1-	Audio	R (0.5Vrms ≤1kΩ)	⊙→
2-	Audio	R (0.5Vrms ≥10kΩ)	⊙
3-	Audio	L (0.5Vrms ≤1kΩ)	⊙→
4-	Audio		⊥
5-	Blue		⊥
6-	Audio	L (0.5Vrms ≥10kΩ)	⊙
7-	Blue	(0.7Vpp/75Ω)	
8-	CVBS-status	0-1.3V:INT	
		4.5-7V:EXT 16:9	
		9.5-12V:EXT 4:3	⊙
9-	Green		⊥
10-		Easy link	
11-	Green	(0.7Vpp/75Ω)	
12-			
13-	Red		⊥
14-	RGB-status		⊥
15-	Red	(0.7Vpp/75Ω)	

16- RGB-status (0-0.4V:INT
1-3V:EXT/75Ω)
17- CVBS
18- CVBS
19- CVBS (1Vpp/75Ω)
20- CVBS (1Vpp/75Ω)
21- Earth socket

8- B
9-
10-
11-
12-
13 -Hsync
14- Vsync
15-

2.2.3 *EXT3(in): CVBS+Audio*



1-
2- Audio R (0.5Vrms >10kΩ)
3-
4- Audio
5-
6- Audio L (0.5Vrms>10kΩ)
7-
8-
9-
10-
11-
12-
13-
14-
15-
16-
17- CVBS
18- CVBS
19-
20- CVBS (1Vpp/75Ω)
21- Earth socket

2.2.4 *Audio out:*

- Audio L(constant level 0.5Vrms; ≤ 1KΩ/ variable level)
Audio R(constant level 0.5Vrms; ≤ 1KΩ/ variable level)

2.2.5 *Audio VGA-in:*

- Cinch Audio L(0.5Vrms ≥ 10KΩ,)
- Cinch Audio R(0.5Vrms ≥ 10KΩ)

2.2.6 *Audio VGA-out:*

Cinch Audio L(0.5Vrms ≤ 1kΩ)
Cinch Audio L(0.5Vrms ≤ 1kΩ)

2.2.7 *VGA-in/VGA-out*

1- Red (0.7Vpp/75Ω)
2- Green (0.7Vpp/75Ω)
3- Blue (0.7Vpp/75Ω)
4-
5-
6- R
7- G

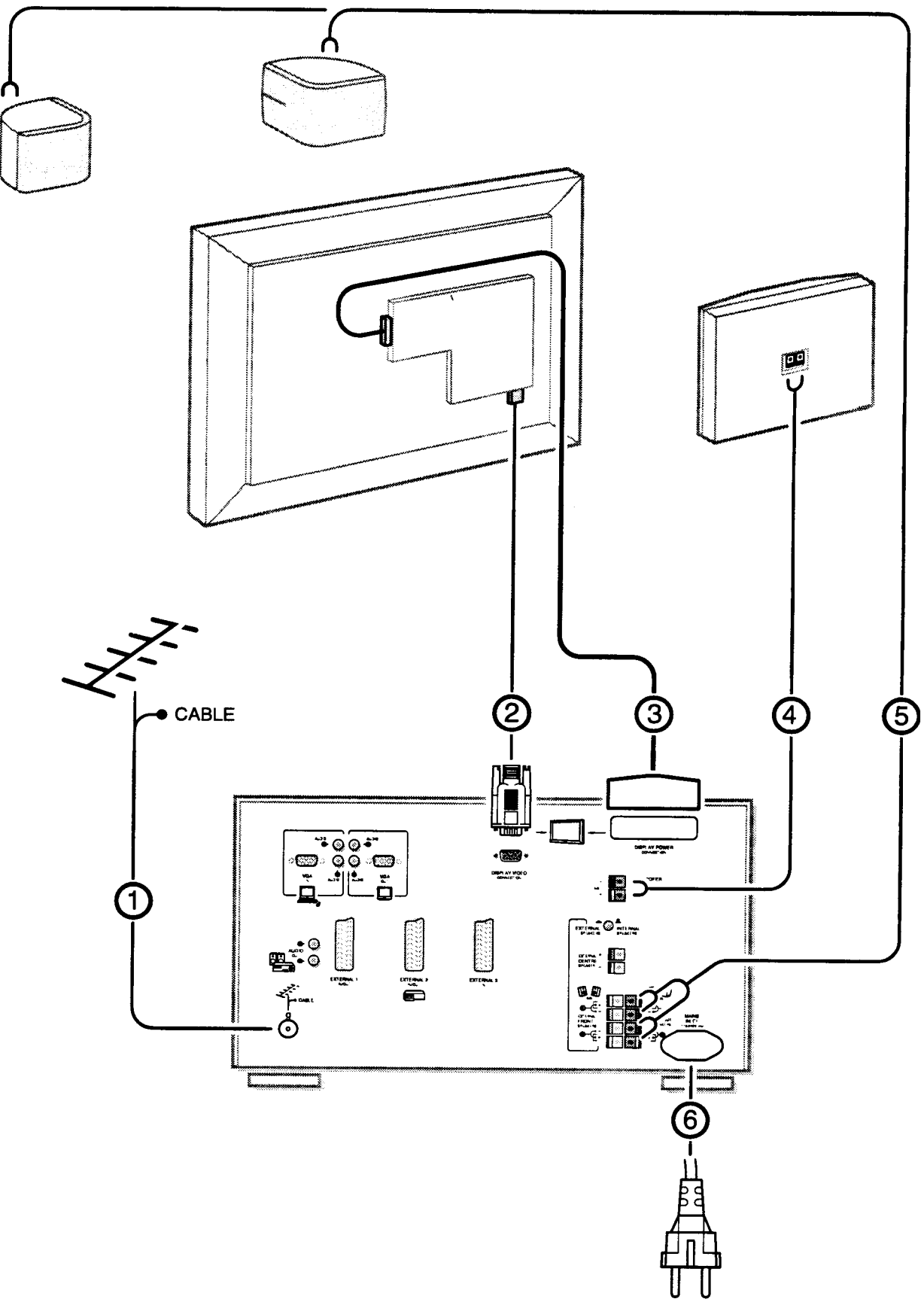


Fig 2-2

3 Safety Instructions, Warnings and Notes

3.1 Safety Instructions

If the mains switch is switched off, the set still has live voltages on the mains input filter, as this is positioned before the mains switch. When the mains switch is switched off , parts of the following panels: Pre-conditioner, Audio & Standby Supply and the Set & Display Supply are live. (all these panels are inside the e-box). This is due to the fact that the relays on the Pre-conditioner circuitry to de-activate all circuits behind it, is single-pole switched. The service-technician will be warned with a Safety warning sticker on the inner e-box.
It is not allowed to operate the FTV-set without glass plate. One function of this glass plate is to absorb Infrared Radiation. Without this glass plate the level of Infrared Radiation produced by the plasma display could damage your eyes.

1. Safety regulations require that during a repair:
   - The set should be connected to the mains via an isolating transformer (in this particular case a transformer of ≥ 800 VA);
   - Safety components, indicated by the symbol, see figure above, should be replaced by components identical to the original ones;

2. Safety regulations require that after a repair the set must be returned in its original condition.
   - Note:
     The wire trees should be routed correctly and fixed with the mounted cable clamps.
   - The insulation of the mains lead should be checked for external damage
   - The electrical DC resistance between the mains plug and the secondary side should be checked (only for sets which have a mains isolated power supply). This check can be done as follows:
     - unplug the mains cord and connect a wire between the two pins of the mains plug;
     - set the mains switch to the on position (keep the mains cord unplugged!);
     - measure the resistance value between the pins of the mains plug and the metal shielding of the tuner or the aerial connection on the set. The reading should be between 4.5 MΩ and 12 MΩ;
     - switch off the FTV and remove the wire between the two pins of the mains plug

   The cabinet should be checked for defects to avoid touching of any inner parts by the customer.

3.2 Warnings

ESD
All ICs and many other semiconductors are susceptible to electrostatic discharges (ESD). Careless handling during repair can reduce life drastically. When repairing, make sure that you are connected with the same potential as the mass of the set by a wristband with resistance. Keep components and tools also at this same potential.

2. Available ESD protection equipment:
   a. anti-static table mat, large 1200x650x1.25mm: 4822 466 10953
   b. anti-static table mat, small 600x650x1.25mm: 4822 466 10958
   c. anti-static wristband: 4822 395 10223
   d. connection box (3 press stud connections, 1 MΩ): 4822 320 11307
   e. extension cable (2 m, 2 MΩ; to connect wristband to connection box): 4822 320 11305
   f. connecting cable (3 m, 2 M Ω; to connect table mat to connection box): 4822 320 11306
   g. earth cable (1 M Ω; to connect any product to mat or connection box): 4822 320 11308
   h. complete kit ESD3 (combining all 6 prior products - small table mat): 4822 310 10671
   i. wristband tester: 4822 344 13999

3. Never replace modules or other components while the unit is switched on.
4. When making settings, use plastic rather than metal tools. This will prevent any short circuits and the danger of a circuit becoming unstable

3.3 Notes

A glass plate is positioned before the plasma display. This glass plate can be cleaned with a slightly humid cloth. If due to circumstances there is some dirt between the glass plate and the plasma display panel it is recommended to do some maintenance by a qualified service employee only. Never disconnect the power display cable when the set is operating.
With DST no failures (error-codes) can be read, when set is in Service-mode.
If DST reacts with 'error 2', there is no communication between set and DST. Notice that IR-transmitter LED is positioned at right side of IR-receiver eye of the e-box. Take into account that receive-LED on DST is positioned not in the middle but at the left side. Point corresponding LEDs to each other. In case the amount of Infrared produced by the screen pollutes the communication, the set can be set in Standby-mode. Then still the error-messages can be retrieved.

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4 Repair instructions

4.1 General repair approach

As the product is rather complex for servicing, it has been decided to repair the set from the dealers' perception in an easy way. The dealer is expected to diagnose in high level functions, where the set-problem is located. This can be:

electronic box (e-box) and some mechanical parts (see figure 12-2)
electrical parts of display box (see figure 12-1):
- plasma display [FU]
- pdp-interface panel [FI]
- pdp-discharge panel [FD]
- led-display panel [FW]

connections, being (see figure 12-2):
- display video cable
- display power cable
- mains cord
- aerial cable

styling parts of display box (see figure 2-2)

The repair procedure will be explained step by step.

1. First the dealer does some nuisance check ups with the customer, either together with the customer by phone or by visiting the customer.
2. When the complaint is valid, the repair technicians of the dealer (2 persons) take as well the display-box as e-box to dealer's site. Use will be made of foam cushion and set will be transported to the dealer's site. Cabling will be left at Customer's home, if necessary. Dealer can order these cables separately. If the complaint has to do with a mechanical or styling part, this can be ordered and replaced at the Customer's home.
3. At the dealer's site the set is being diagnosed. The problem could be caused by one of the next parts/components:
   - internal e-box
   - pdp-interface-panel of display-box [FI]
   - pdp-discharge-panel of display-box [FD]
   - led-display panel of display-box [FW]
   - loudspeaker-assemblies
   - plasma display panel [FU]
   - one of the fans in the e-box
   - one of the cables (mains cord [6], aerial cable [1], display video cable [2], display power cable [3]
4. After diagnosis the dealer orders a spare part directly at the local service organization. See also paragraph 4.2.
5. The dealer repairs, and aligns black and white settings of the set if necessary, checks and returns the set to the customer.
6. Set will be re-installed at the Customer's home.

If the e-box is defective the dealer can order an inner e-box (so without styling); see paragraph 4.2.

Pack the defective e-box in the packaging of the new received e-box and sent it to your local service organization. This defective e-box should be accompanied with a copy of a repair form on which the failure description is stated. This information will be used as input for the Central Repair Workshop.

4.2 Central Repair Procedure:

This set contains one or more printed wiring boards or assemblies, which will be repaired centrally via a 'central repair procedure'. These parts/assemblies are marked with a 'R' in the spare parts list (chapter 13). Contact your local service organization for a resent request. After confirmation a replacement assembly will be sent to you. Send the defective assembly including a filled-in 'repair form' to your local service organization. The defective parts should be correctly packed inclusive ESD protection material. The original packing of the replacement part can be used for this purpose. The accompanying 'repair form should contain all basic information such as:

- full name and address of the sender
- service code of part
- model and/or type number part/assembly
- full model number of the set
- serial number/production code of the set
- description of the failure including timing indication (immediate, after. minutes warm-up up, sometimes)

For this purpose you can make use of a standard repair form: ordering code 4822 727 20133 (packing quantity 10 pieces)

For the plasma display a different procedure is valid. A special form accompanies the packaging of the new received panel. It has been agreed with the display supplier to provide them with this information.

4.3 Repair instructions

Available service accessories : (for code numbers see the spare parts list)

- VGA interface block
- Dealer Service Tool (RC7150)
- Test pattern-software (floppy)
- Dealer stand
- Connecting cables (in case the connecting cables are left in the Customer's home)
  - Mains power cable
  - Display power cable
  - Display video cable

Workshop equipment to support the diagnosis:

PC (486 with Windows and with a true colour video card)
PC-monitor that can handle 50 and 60 Hz frame frequencies.
Foam-cushion for protection, transportation
Service-generator (e.g. PM5518), multi meter, oscilloscope
Torque screwdrivers 10, 15 and 20

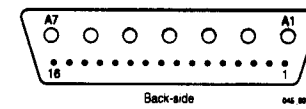


Figure 4-1

Connections	descriptions	Voltage
A1	GND Vs-Va	0 V
A2	Vs	< 185 Vdc
A3	GND Vs-Va	0 V
A4	Va	< 65 Vdc
A5	GND Vs-Va	0 V
A6	Vcc	< 5.25 Vdc

A7	GND Vcc	0 V
1	Vrs	< 2Vdc
2	Vra	< 2Vdc
3	Vrr	< 5Vdc
4	Vcc, sense	< 5.25 Vdc
5	Va, sense	< 65 Vdc
6	Vs, sense	< 185 Vdc
7	GND Sense	0V
8	V12	< 14 Vdc
9	GND V12	0 V
10	+5 Vstby	< 5.25 Vdc
11	C	< 30 Vp
12	GNDC	0 V
13	L	<30 Vp
14	GND L	0 V
15	R	< 30 Vp
16	GND R	0 V
17	reserve	< 30 Vdc

Check e-box:
The e-box can be checked in an easy way.

- Supply-part: See figure 4.1 of connector-socket of e-box, located at the back of the e-box. Remove display power cable and display video cable from e-box. (Note: without disconnecting the display video cable, the set will go in protection). Make with a wire a robust connection between connection-hole A6 (Vcc, 5 V) and connection-hole 3 (Vrr). Now you can measure:
  pin A2: 165 V (Vs) versus A1
  pin A4: 55 V (Va) versus A1
  pin A6: 5 V (Vcc) versus A7
  pin 8: 12 V (V12) versus shielding e-box
  pin 10: 5 V (5Vstby) versus shielding e-box
  Should this voltages be not available then exchange e-box by a new one

  Processing-part: connect display video cable from e-box to VGA-monitor (ordering code 4822 263 21189). Use special VGA-interface block in series with this cable. (this block interrupts the signals 4 and 11 of the cable). If monitor does not give correct picture, exchange e-box. Take care the monitor can handle 50 and 60 Hz frame-frequencies
  Additional repair instructions are given in the fault finding tree of figure 4-6.

2. Check display-box: (place the display in a stand; ordering code 4822 462 11011).
   - Check with working e-box (in order to supply the display) and with VGA-signal of a PC whether the FTV-display functions. (The start-up behaviour of DOS of a PC, gives a VGA 640x480 picture on the screen). If this functionality is not in order, do the following:
     Remove encasing board (this board covers some PWBs at the back of the display-box). (10 torque 10 screws)

3. Check Pdp-discharge panel [FD]:
   See layout FD-board (figure 4-2).
   Measure at:
   - FD1: Vs should be 175 V, versus GND FD172.10
   - FD2: Va should be 60 V, versus GND FD172.10

   - FD3: Vcc should be 5 V, versus GND FD177.3
   - FD4: V12 should be 12 V, versus GND FD175.2
   - FD5: V-fan should be between 5 and 12 V, versus GND FD175.2
   - FD6: 5Vstby should be 5 V, versus GND FD175.2

4. If voltage is missing check before and after display power cable connections itself. Also check whether the voltages Vs, Va and Vcc are still correct at the output connectors FD171 and FD173. See DC-supply diagram in chapter 5. If this is defective the pdp-discharge panel is defective and should be exchanged.

   If Vrr is high however for a short while (measure with oscilloscope) or constant low, then the display is most likely defective. (check as above whether e-box itself is functioning well). In case of doubt please double check this, to avoid unnecessary transport costs
   When the test voltages however are correct and also the fans operate (at top side of display box there are 4 fans), the adjacent panel must be checked. This is the pdp-interface panel.

5. Check Pdp-interface panel [FI]:
   The pdp-interface-panel is fixed via the D-sub socket (two 5 mm bolts to be unscrewed with a socket spanner) and some plastic holders. Remove the panel from the holders. Turn it 180 degrees and place it in the holders again. The solder side can be accessed now. In figure 4-3 the test points overview is showed together with wave forms. Check first the supply-voltages. The GND connected to the shielding of the video display cable connection can be used as GND.
   Before measuring, the set must be set in a default condition. The set will be placed in Service default Mode via the dealer remote. (See chapter 6.). A PAL-colour pattern signal is generated with a service generator on a frequency of 475.25 MHz.
   The test points can be measured with a oscilloscope (see wave forms adjacent figure 4.4) and with a DC-voltmeter
   Results should be:
   PD1: 5V
   PD2..PD4: Red, green, Blue
   PD5: Contrast Voltage. Will be typical 4.3 V
   PD6: VsyncN
   PD7: HsyncN
   PD8 : RC5
   PD9 : I2C SDA
   PD10..PD12: Red, Green, Blue
   PD13: I2C SCL

   For the test points PD15 until PD38 following signal condition is required. The set must be set via the dealer remote in Service Alignment Mode (see chapter 6). Via menu-structure an internal test pattern can be activated. The picture content changes from black to white and vice versa in about 4 seconds. It can be checked now whether one or more of the 24 digital outputs (of Red, Green and Blue) function adequately dependent of colour loss or discontinuous pictures:
   PD15..PD22: (digital outputs of Red ADC from most significant bit to the least significant bit)
   PD23..PD30: (digital outputs of Green ADC from most significant bit to the least significant bit)
   PD31..PD38: (digital outputs of Blue ADC from most significant bit to the least significant bit)

PD39: (DCLK)
PD40: BlankN
PD41: HsyncN
PD42: VsyncN

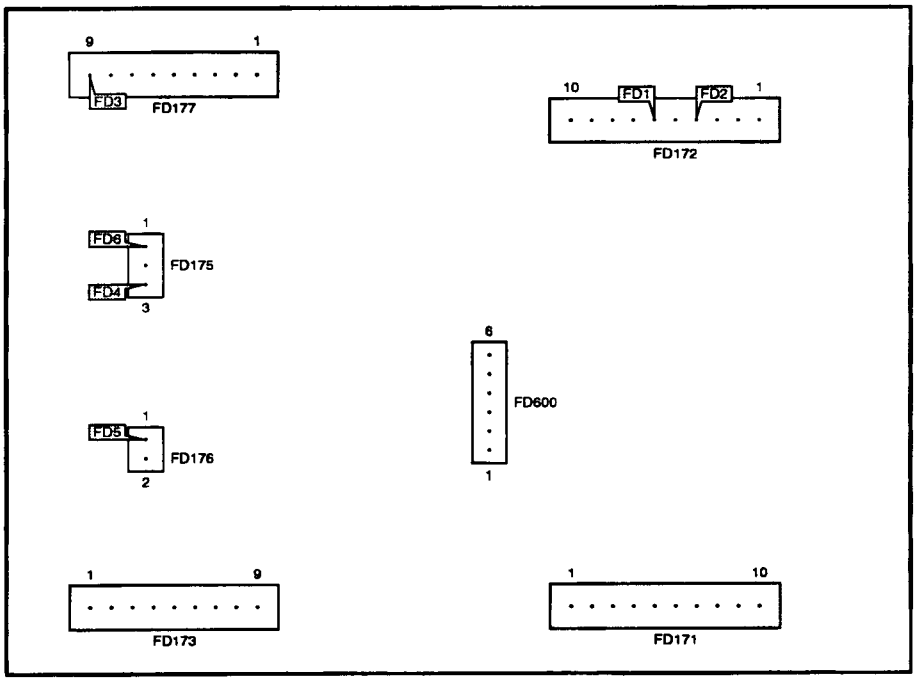
If test points do not match with the referring wave forms, the panel is defective and must be exchanged by a new one.

6. Check Led panel display [FW]: (see figure 4-4)
   Check availability of power supplies 5Vstby, Vcc. Check whether components 3301, 5300 or 5320 are interrupted. If one of the components is defective, exchange FW-panel. If absence 5VStby is caused by pdp-discharge-panel or pdp-interface-panel check both panels. If otherwise the e-box must be exchanged. See Vdc-supply diagram (chapter 5)

7. Exchange the glass plate: (see figure 12-1)
   Remove front profile [1] by two torque-15 screws at bottom of display-box. Disassemble glass plate fixation at the top side of glass plate. Remove glass plate and exchange with a new one [2].

8. If the plasma display is defective exchange the plasma display. (see figure 12-1)
   - Remove front profile [1], glass plate fixation and glass plate [2]
   - At the top middle of the display-box (front-side) 2 connectors should be pulled towards you. Disconnect those in order to make wiring loose from back profile [7]
   - Remove back profile fixation from back cover by 8 torque-20 screws.
     Remove the emc-springs [9]
   - Place back cover with plasma display with glass side on a foam-cushion.
   - Remove back cover from plasma display by 8 torque-20 screws, also the 2 Z-shape copper springs at right top side (rear view)
   - Write down serial number of plasma display and complaint-code on mentioned special form; see paragraph 4.2
   - Assemble wooden plate (delivered with new display panel) with accompanied screws
   - Pack defective panel in original packaging and return it.
   - Assemble new plasma panel in reverse sequence (inclusive 2 two Z-shape springs) and check functioning display.

9. Exchange defective fan, loudspeaker assembly (see exploded view mechanics display-box, chapter 12)
   Indicated in the exploded views



(Component-side)

CL 76532045_002.ai
081097

Figure 4-2

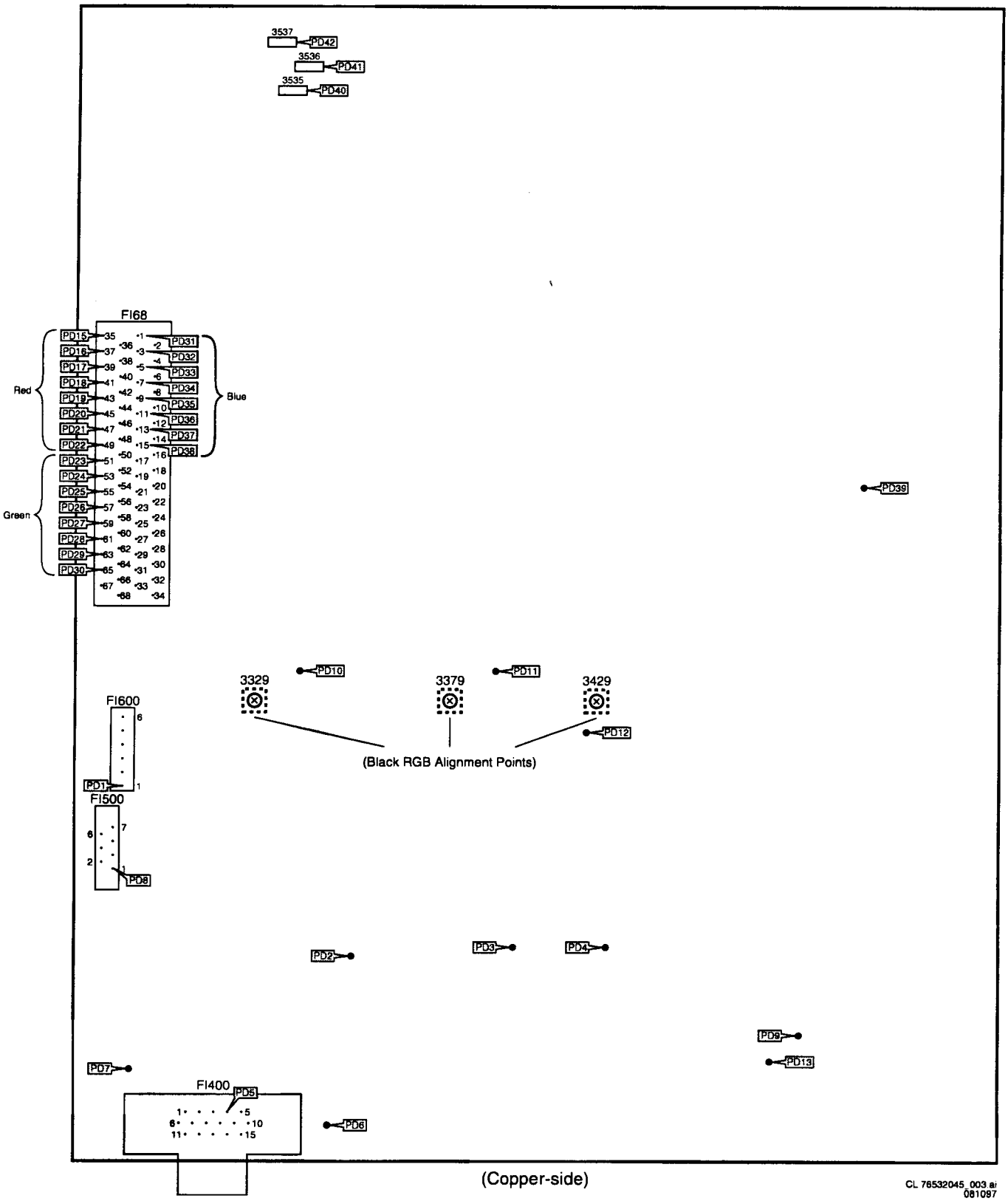

3537
PD42
3536
PD41
3535
PD40
FI68
PD15
PD16
PD17
PD18
PD19
PD20
PD21
PD22
PD23
PD24
PD25
PD26
PD27
PD28
PD29
PD30
Red
Green
PD31
PD32
PD33
PD34
PD35
PD36
PD37
PD38
Blue
PD39
3329
3379
3429
PD10
PD11
PD12
(Black RGB Alignment Points)
FI600
PD1
FI500
PD8
PD2
PD3
PD4
PD9
PD13
PD7
FI400
PD5
PD6
(Copper-side)
CL 76532045_003.ai
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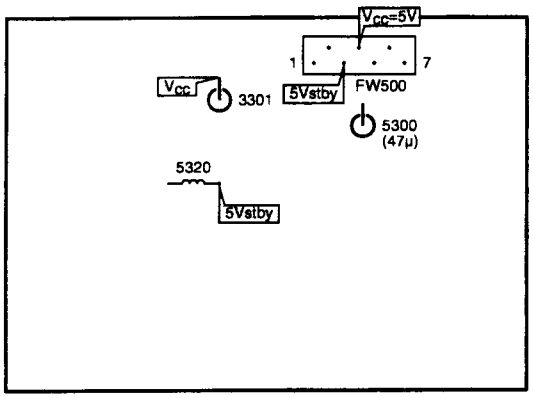
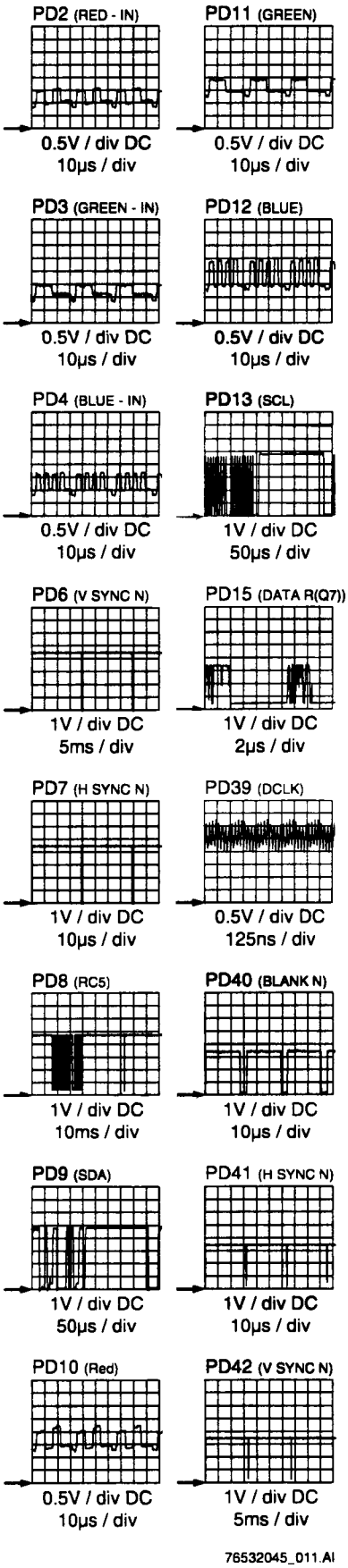
Figure 4-3



(Component-side)

CL 76532045_001.ai
081097

Figure 4-4



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201097

Figure 4-5

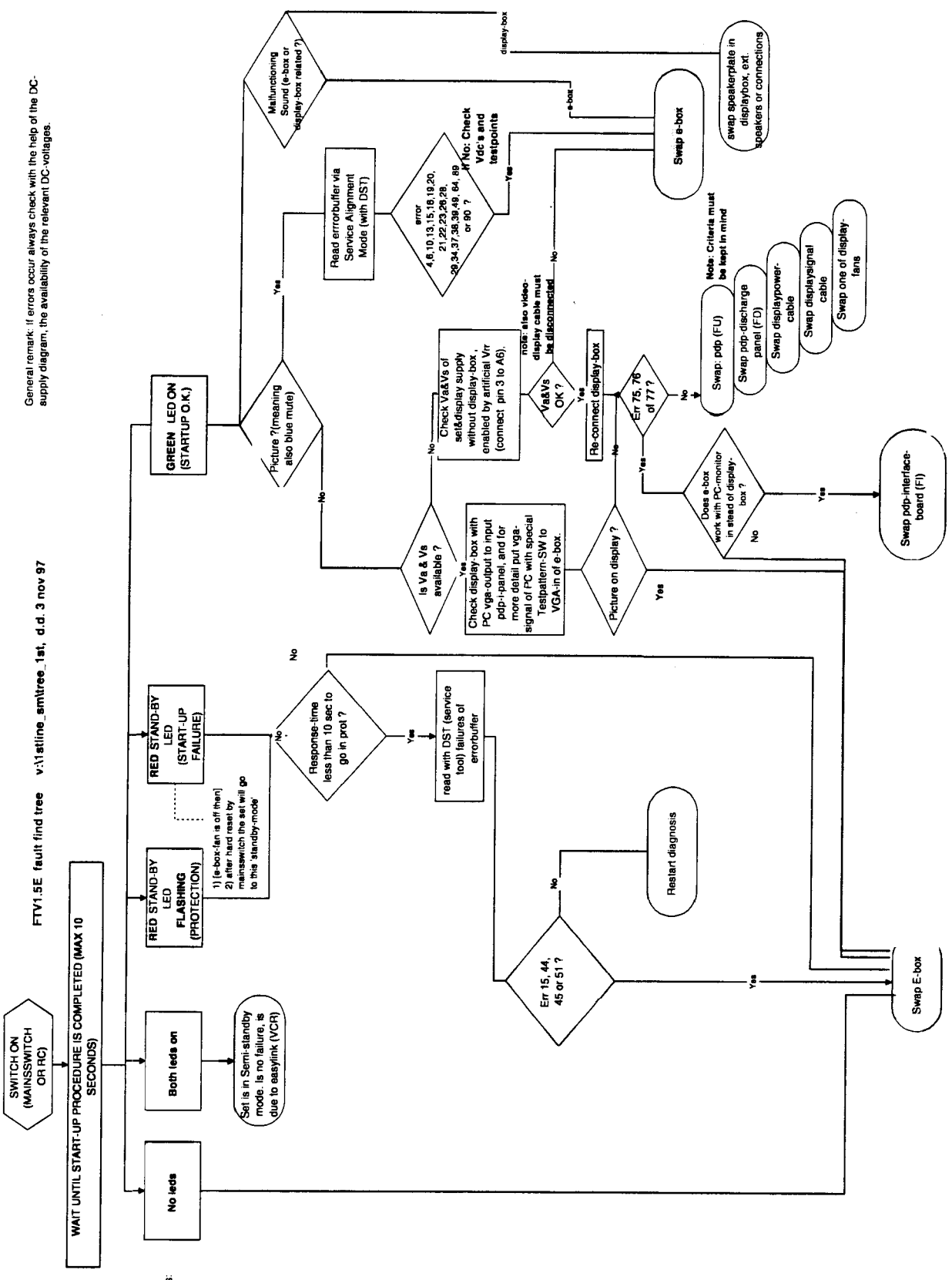
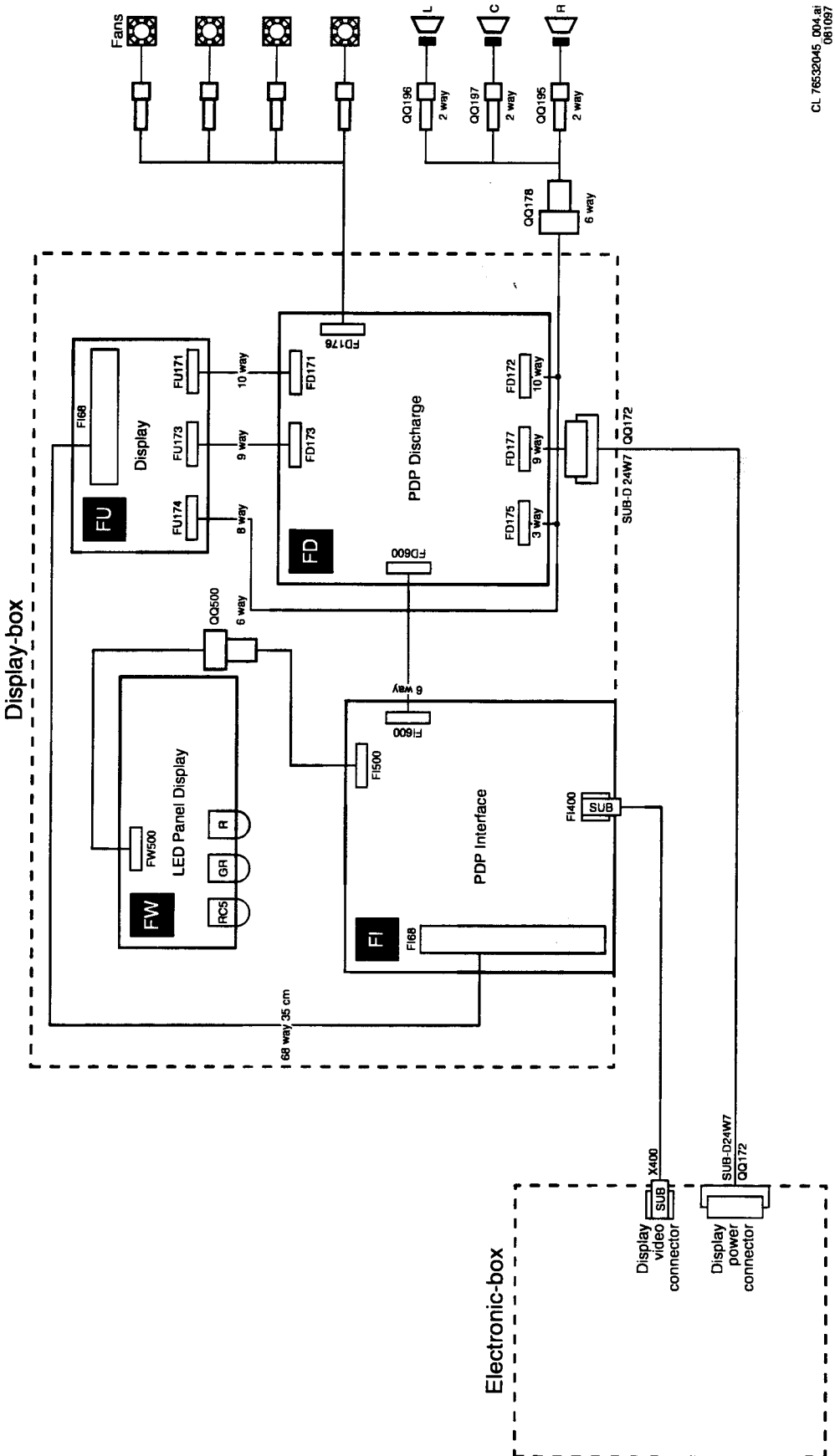

General remark: If errors occur always check with the help of the DC-supply diagram, the availability of the relevant DC-voltages.
FTV1.5E fault find tree v:\1stline_smttree_1st, d.d. 3 nov 97
SWITCH ON (MAINSSWITCH OR RC)
WAIT UNTIL START-UP PROCEDURE IS COMPLETED (MAX 10 SECONDS)
E-box leds:
No leds
Both leds on
Set is in Semi-standby mode. Is no failure, is due to easylink (VCR)
RED STAND-BY LED FLASHING (PROTECTION)
1) [e-box-fan is off then] 2) after hard reset by mainsswitch the set will go to the standby-mode
RED STAND-BY LED (START-UP FAILURE)
GREEN LED ON (STARTUP O.K.)
Response-time less than 10 sec to go in prot ?
read with DST (service tool) failures of errorbuffer
Err 15, 44, 45 or 51 ?
Restart diagnosis
Swap E-box
Picture ?(meaning also blue mute)
Read errorbuffer via Service Alignment Mode (with DST)
error 4,8,10,13,15,18,19,20, 21,22,23,26,28, 29,34,37,38,39,49, 64, 89 or 90 ?
No: Check Vdc's and testpoints
Swap e-box
Malfunctioning Sound (e-box or display-box related ?)
display-box
e-box
swap speakerplate in displaybox, ext. speakers or connections
Is Va & Vs available ?
Check Va&Vs of set&display supply without display-box , enabled by artificial Vrr (connect pin 3 to A6).
note: also video-display cable must be disconnected
Va&Vs OK ?
Re-connect display-box
Check display-box with PC vga-output to input pdp'i-panel, and for more detail put vga-signal of PC with special Testpattern-SW to VGA-in of e-box.
Picture on display ?
Err 75, 76 of 77 ?
Does e-box work with PC-monitor in stead of display-box ?
Swap pdp-interface-board (FI)
Swap: pdp (FU)
Swap pdp-discharge panel (FD)
Swap displaypower-cable
Swap displaysignal cable
Swap one of display-fans
Note: Criteria must be kept in mind
No
Yes

Figure 4-6

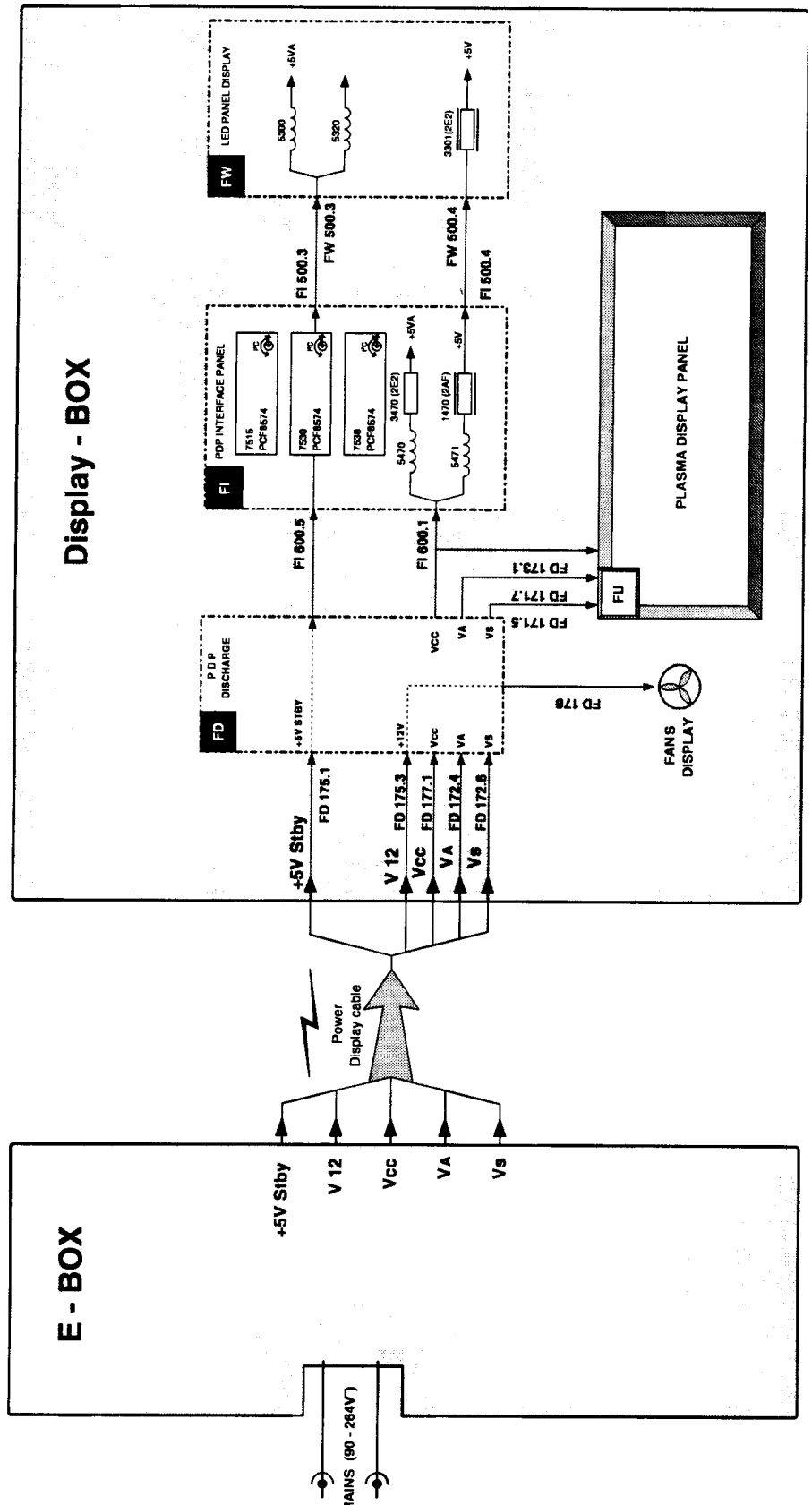
5 Block diagrams

Connection diagram

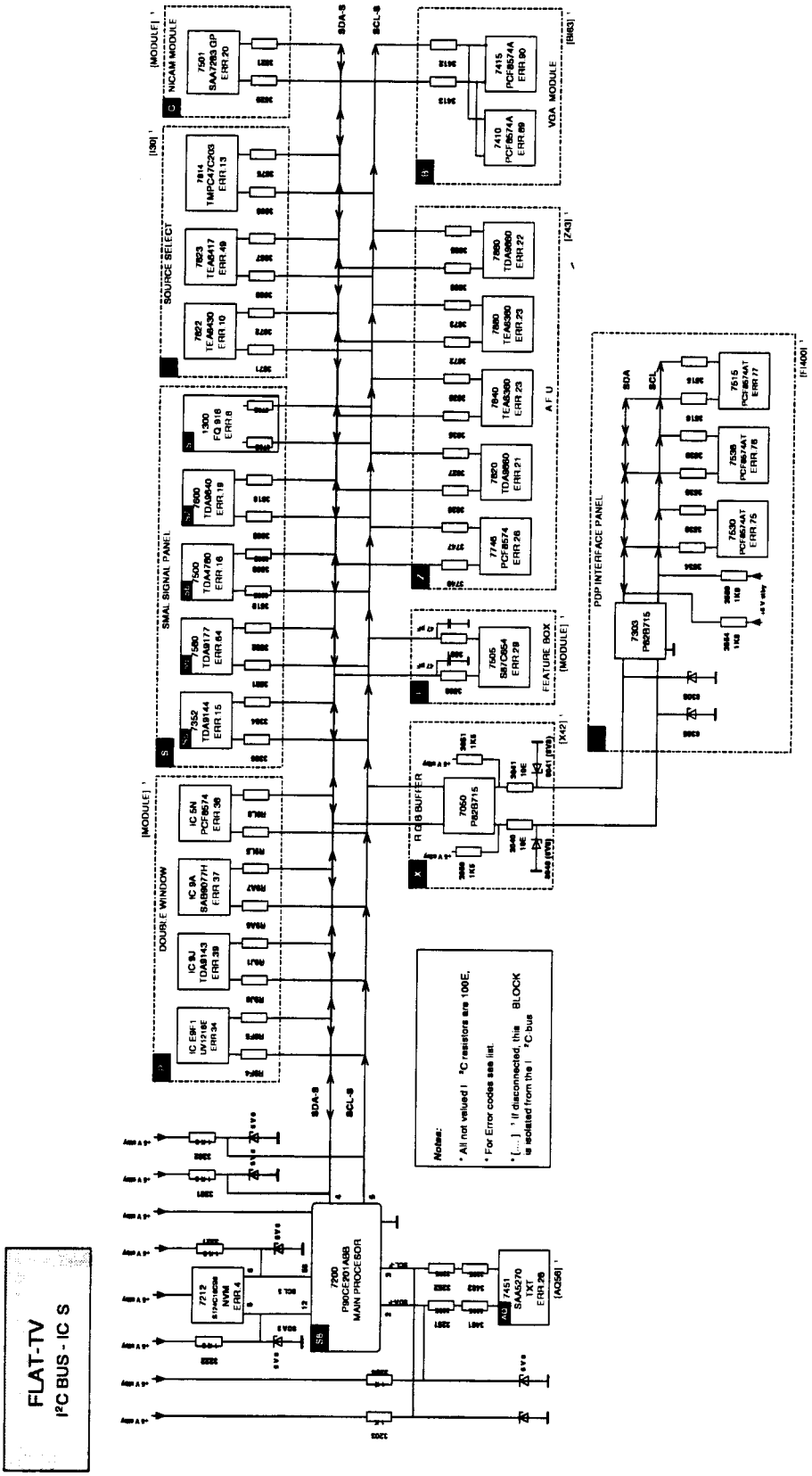


FLAT-TV

DC SUPPLY VOLTAGE DIAGRAM (limited)



5 Block diagrams



VSDNDLINE SMUIC_BUS.VSD
Last modified date: Monday 3 November

6 Service tools/Service tips

6.1 Service Hardware-tools

DST (Dealer Service Tool RC7150) For detailed explanation see paragraph 6.6.
In the main-software of the set a service-protocol is implemented.
By putting the set in a special mode, the software can detect whether ICs that are connected to the so-called I2C-bus operate adequately.
Via an infrared-transmitting led, located behind the cover of the e-box, at the right from the IR-receiver eye, information can be sent to the DST. The DST has a display on which the error codes can be displayed (see error table 6.4). If one of the codes 4, 6, 10, 13, 15, 16, 19, 20, 21, 22, 23, 26, 28, 29, 34, 37, 38, 39, 44, 45, 49, 51, 64, 89, 90 are displayed, the defect is e-box related. If code 75, 76 or 77 than the failure is display-box or e-box related.
PC-monitor.
This PC-monitor gives the possibility to test the e-box signal processing without display box. This monitor must be foreseen with a special VGA-interface block (ordering code 4822 263 21189) that interrupts pin 4 and 11 of VGA-cable. (4 = contrast down, 11=RC5). Take care that the connected monitor can handle 50 Hz and 60 Hz frame frequencies.

6.2 Service Software-tools

Service related Software-modes:

- SAM (Service Alignment Mode)
  Push <align >-button of DST and input password "3140" and push <OK>-button.
  The next data will be displayed:
  Line (1) Date and version number SW
  Line (2) Operating hours
  Line (3) The error buffer-content {note: maximal 10 error}
  xx1 xx2 xx3 xx4 xx5
  xx6 xx7 xx8 xx9 x10
  {First mentioned error (top left) is the last occurred error}
  Line (4) Description defective module.
  With 'Reset error buffer' the buffer can be erased.
  With 'Functional test' the error check will be executed again.
  With ' Alignments' a lot of settings can be made. (more details in chapter 'alignments' (see chapter 8)
  The SAM can be de-activated by pushing the <menu>-button
- SDM (Service Default Mode) Push on <default >-button on dealer remote . Set is tuned in this mode on a frequency of 475.25 MHz, with pre-programmed brightness-, contrast-, colour saturation- and sound volume-level. Should the set be in blue mute due to the absence of signal, the blue-mute will be de-activated. The SDM can be de-activated by switching the set to Standby. No other way.

Customer/Service related software-mode CSM (Customer Service Mode).
Push simultaneous for at least 4 seconds on a random button of the local keyboard and on the <mute>-button of the Remote Control hand set of the FTV set.
The next data will be displayed:
Line (1): Version: ..... (= implemented software version)
Line (2): Errors: ..... (= detected error codes)
Line (3): HW opt nr 01280 14353 14873 27468
Line (4): SW opt nr 00006 07955
Lines (5,6,7): Hidden Modes, in case active, it will be shown here, as Childlock, Timer on, Sleeptimer on, Phantom.

This 'Customer Service Mode' (CSM) is a special service mode which can be activated and de-activated by the customer.
This CSM is a 'read only' mode, therefore the customer is unable to store other settings via this mode.
The customer de-activates the CSM by:

- selecting any button on the remote control handset
- switching the set to Standby and then switching on again
- switching the set off (mains switch) and then switching back on again

Pdp-test pattern. (internal in set)
Under SAM-menu, via Alignments-menu and General-menu the Pdp-test pattern can be activated. (slowly changing picture from full-black to full-white and vice versa). With this pattern the display and pdp-interface panel can be checked in an easy way. However the e-box must be functioning

- Test pattern-software. (external).
  Via VGA-input of the e-box , the VGA-signal output of a PC could be connected. With the test pattern-software [ordering code 4822 901 10027], the functioning of the screen can be checked in more detail.
  Additional information:
  The test patterns are pictures that should be made visual with a viewer-program. The test patterns can be displayed with the program ACDSee.
  This program needs a Windows-environment.
  The video card driver of the PC must be positioned in VGA-mode, with true colour option (3x8 bits 640x480).
  The dealer needs the ACDSee program in order to generate the patterns.
  TV must be switched in <16:9>-mode.
  After starting the ACDSee program, you see the following files on the screen:

  - black (black.gif)
  - red (red.gif)
  - green (green.gif)
  - blue (blue.gif)
  - white (white-gif)
  - white bar on black background in order to check 'contrast down'-signal functioning. [output of pdp-i-panel]. (white_bar.gif))
  - red, green, blue sawtooth (rgbsaw.jpg)

- Controlling ACDSee program
  With left-button of mouse and <CNTL>-button of PC-keyboard you can select the files you want to activate. To show the patterns activate 'View'-line .
  When showing pictures place cursor marker in the picture and push right hand mouse-button.
  Via 'options', full-screen, page flip delay and 'Start Slideshow' must be chosen and saved. Under Control Panel of Windows the video card can be selected to 'true colour' and to the '640x480'-format. Only with these settings all grey levels of the pixels of display can be tested.
  The ACDSee-program can run different pictures sequentially or apart.

6.3 Service Tips

- Tip how to check whether display-box functions, with partly functioning e-box . (meaning the power supply part)
  The display-box is powered via e-box . The video signal input of the display-box is now coming from a PC.

6 Service tools/Service tips

When booting PC, it will start in DOS, with a certain VGA-output format (640h,400v/60 Hz). The rough functioning of display is proven then.

6.4 Error code table

Error	Device	Description	Item	Panel	Defective module indication in SAM	Exchange
0	no error		-	-	No errors	e-box
4	ST24C16B6	NVM EAROM 2048 bytes	7212	S8	Control	e-box
6	FQ916	Frontend	1300	S1	Frontend	e-box
10	TEA6430	Audiosignal switch	7822	I	Source Select	e-box
13	TMPC47C203	I/O processor	7814	I	Source Select	e-box
15	TDA9144	Video + sync processor	7352	S5	Video processing	e-box
16	TDA4780	Video controller	7500	S6	Video control	e-box
19	TDA9840	2SC Sound Decoder	7600	S2	Stereodecoder	e-box
20	SAA7283GP	Nicam Decoder	7501	G	Nicam Decoder	e-box
21	TDA9860	Audio processor	7820	Z	Audio feature Unit	e-box
22	TDA9860	Audio processor	7860	Z	Audio feature Unit	e-box
23	TEA6360	Equalizer-IC	7840 7880	Z	Audio feature Unit	e-box e-box
26	PCF8574P	I/O-expander for Source Select	7746	P	Audio Feature Unit	e-box
28	SAA5270	TXT processor	7451	AQ	Teletext	e-box
29	PCF83CE652 featurebox	FBX microprocessor	7505	F	Feature box	e-box
34	UV1216E	DW tuner	E9F1	P	Double Window	e-box
37	SAB9077H_dwi	PIPO (Picture In Picture Out)	IC9A	P	Double Window	e-box
38	PCF8574_dwi	I/O-expander for DW	IC9N	P	Double Window	e-box
39	TDA9143_dwi	Video + Sync processor for DW	IC9J	P	Double Window	e-box
44	Supply 5 V	Check TSA5512 (Frontend) SAA5270 UV1216E PCF83CE652	1300 7451 E9F1 7505	S1 AQ P F	+ 5V Supply error	e-box
45	Supply_8V	Check TEA6430 (I)	7822	I	+8V Supply error	e-box
49	TEA6417	Videosignal switch IC	7823	I	Source Select	e-box
51	I2C_slow_bus	Blocked I2c slow-bus (shorted SDA, SCL or SDA to SCL)	-	-	I2C bus blocked	e-box
64	TDA9177	LTP	7580	S6	SSP	e-box
75	PCF8574AT	I/O-expander for Pdp-interface	7530	FI	Pdp-interface	pdp-interface panel or e-box
76	PCF8574AT	I /O-expander for Pdp-interface	7538	FI	Pdp-interface	pdp-interface panel or e-box
77	PCF8574AT	I/O-expander for Pdp-interface	7515	FI	Pdp-interface	pdp-interface panel or e-box

89	PCF8574A	I/O-expander for VGA-module	7410	BI	VGA-module	e-box
90	PCF8574A	I/O-expander for VGA-module	7410	BI	VGA-module	e-box

Remark: When "ERROR 2" displayed on DST, this means that there is no communication from FTV to DST.

6.5 Possible occurring defects:

Flickering picture (no picture content, but just flickering grey field):

VGA-cable not proper connected

No picture (If more causes are mentioned the lines must be read as or's)

- set in black-mute and aerial connector not connected (press the OSD button on the remote control handset; is OSD present now, then the display panel is OK or switch on the SDM, is there noise on the screen now, then the display is OK)
- supply e-box defective (check Va, Vs, V12, V5, 5Vstby with Vrr connected to 5 V, pin A6 to pin 3)) (no OSD)
- display panel defective (no OSD)
- pdp-interface panel defective (no OSD)
- pdp-discharge panel defective (no OSD)
- e-box defective (e.g. VGA-module)

Noisy picture:

display is not sharp due to aerial signal (investigate your aerial signal, it could also help to mount a ferrite core (4822 526 10694) around aerial cable or VCR/TV coaxial cable.

Distorted picture:

- display shows row- and/or column failures, or an increasing amount of cell-defects (cause display)
- display shows colour defects (cause pdp-interface panel or e-box or display)
- display shows synchronisation-failures (cause pdp-interface panel, e-box, or display)
- display shows spots, affected area's (cause display)
- display shows burning effects. (cause misuse, excessive operating hours)
- display shows spots with colour differences. (when set is positioned on an altitude higher then 2000 meters, it could occur due to the technology of this display that the performance decreases. This effect can not damage the display.)

No Sound:

Ext. Loudspeaker-switch is placed in wrong setting
Set is in 'external amplifier'- mode, surround mode set in 'prologic' and center mode in 'phantom'. In case the external amplifier is not switched on , then the set will not produce any sound in case the set receives just a stereo signal.
Or external amplifier must be switched on or center mode should be placed in normal

Set not controllable with local keyboard buttons e-box:

set is in Childlock-mode. De-active with RC, in features-menu.

Set does not respond on remote control:

- Batteries of remote control could be empty. Check whether set responds with IR-receiving eye on e-box. Door must be opened. . If this works replace batteries.

Other electronic equipment can not be controlled or does not function adequately due to operating Flat-TV:

- Check whether other infrared-controlled equipment is disturbed by this FTV-set. In case of doubt check functionality other equipment , with FTV-set in reduced contrast-level setting or even in Standby. In case this helps, the cause is known. The Flat-TV produces a small amount of Infrared-radiation which can interfere with infrared-equipment. Vary the position of the other equipment to see if situation can be improved. (Only increasing distance or changing view-angle can help)

6.6 Software protection

The software protection is totally managed by the main microprocessor on the small signal panel and consists out of a continuous checking on the presence of the +5V2 and the +8V supply voltage and the continuous checking on the activity on the I2C bus. This checking is done by testing the communication between the microprocessor and a number of ICs which are connected to this supply voltage. In case one of these ICs do not respond, the protection-processing becomes active and the power supply will be switched to Standby.

Replace e-box.

6.7 +5V protection via main-processor

The main-processor controls via a number of ICs the presence of the +5V supply voltage on the SSP. This controls is realized via I2C. The following ICs are used for the check of the +5V supply voltage:

- TSA5512 (front-end), (error 6)
- SAA5270 (IVT), (error 28)
- Feature box, (error 29)
- UV1216E (DW), (error 34)

In case the above mentioned IC does not respond, the error code of that specific IC is stored in the error buffer together with error 44 (+5V error) and the main-processor switches the set to Standby.

Replace e-box.

6.8 +8V protection via the main-processor

The main-processor controls via a number of ICs the presence of the +8V supply voltage on the SSP. This controls is realized via I^2C. The following ICs are used for the check of the +8V supply voltage:

- Source select, TEA6430, (error 10) In case the above mentioned IC does not respond, the error code of that specific IC is stored in the error buffer together with error 45 (+8V error) and the main-processor switches the set to Standby.
  Replace e-box.

6 Service tools/Service tips

6.9 I^2C protection (error 51)

The (slow) I^2C bus is controlled at each I^2C-command. To do this at every I^2C command a defined start/stop condition is generated. In case this defined start/stop condition fails for a few times after each other, by then error 51 (I^2C error) is placed in the error buffer and the power supply is switched to Standby. I^2C-protection is generated in case the SDA is shorted to earth, in case the SCL is shorted to earth or in case the SDA and the SCL is shorted.

Remark: The (fast) I^2C bus for teletext and the I^2C bus to the NVM are not checked for protection matters

Replace e-box.

6.10 Detailed information about DST

6.10.1 Introduction

This paragraph will give more detailed information about the service modes and the Dealer Service Tool (DST) RC7150.

6.10.2 Installation features for the dealer

One of the innovative features of the Dealer Service Tool is the way in which it is programmed. A complete list of presets can simply be downloaded from the FTV1.5E into the Dealer Service Tool. To make this download possible, a two way communication link, the so called "dealer link", is set up between the RC7150 and the FTV1.5E. To establish this link, the FTV1.5E sets are equipped with an additional Infra Red transmitter LED and the RC7150 has an Infra Red receiver on board. The Dealer Link however only works on short distance, up to 10 cm or 4 inches. For explanation of the installation features of the DST, the directions for use of the DST are recommended (use code 4 for correct downloading).

6.10.3 Dealer Mode

Press the "DEALER" key on the DST to enter the Dealer Mode. In the dealer mode some settings can be changed in order to customize the set.

6.10.4 Diagnose features for the service

The FTV1.5E set can be put in the various service modes via the DST RC7150. (see paragraph 6.2)

6.10.5 Service Default Mode (SDM)

Specification of the SDM:
- Tuning frequency 475.25 MHz
- TV-system for BGLM set to BG, for BGLL'I sets to LL'
- All picture settings at 50% (brightness, colour, contrast, HUE)
- All sound settings at 50% except volume at 25% (so bass, treble, balance at 50%, volume at 25%)
- All service-unfriendly modes are disabled (like sleep timer, child lock, automatic switch off, blue mute)

Entering the SDM:
- By the "DEFAULT" key on the DST while the set is in the normal operation mode.
- Exiting the SDM can only be done via the STANDBY command. By switching off-on the set with the mains switch the FTV1.5E will come up again in the SDM.

6.10.6 Service Alignment Mode (SAM)

Specification of the SAM:
- Software alignments (see chapter 8)
- Option settings (see chapter 8)
- Error buffer reading and erasing. The most recent error code is displayed on the top left side.
- Operating hours counter
- Software version

Entering the SAM:
- By the "ALIGN" key on the DST while the set is in the normal operation mode (or SDM). Enter the password "3140" and push <ok>-button

Exiting the SAM can be done via the MENU command or via switching off-on the set with the mains switch.

6.10.7 Diagnose Mode (only active during transmission of error codes and diagnose 99)

This mode is activated by the DIAGNOSE command on the DST for reading the error codes and erasing the error buffer by the DST even when the set is in protection and so there is no picture (assuming that the power supply and the control part are working). The diagnose Mode is only a temporarily mode (the set will go back to the previous mode), and can not be switched on permanently.

Note The diagnose mode can not be entered if the SAM is activated.

6.10.8 Error codes

Reading error codes from the error buffer
The error buffer can be read in 2 ways:

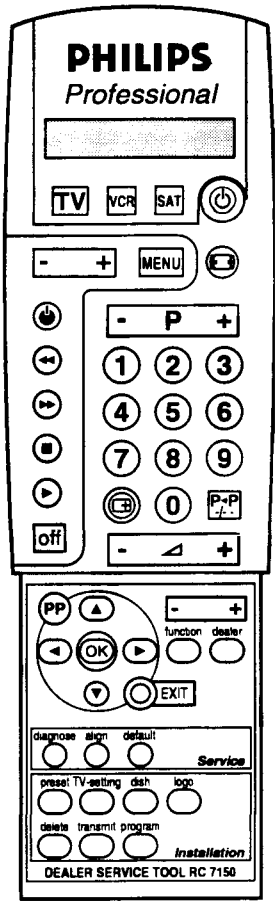
- On the screen via the Service Alignment Mode (SAM)
  In case picture is OK, the error buffer can be read the easiest via the SAM. In the main menu of the SAM the last 10 different error codes occurred are displayed. The most recent detected error code is displayed on the left side, so e.g.:
  0 0 0 0 0 means no error codes present in the buffer
  3 0 0 0 0 means one error code present in the buffer; error code 3
  2 3 0 0 0 means two error codes present in the buffer; error code 2 is the most recent, error code 3 is detected before 2
- On the display of the DST
  If an error has been detected by the FTV1.5E chassis, the set might go into protection. Without the presence of a picture the errors can be read by the DST, as long as the main-processor is still active (green LED continuous and red LED blinking fast (5 Hz); in case of red LED is blinking slow (1.25 Hz) there is a main-processor problem).
  To transmit the errors from the FTV to the DST:
  1. Press the "DIAGNOSE" key (in all modes except the SAM)
  2. Press "1" to view the last error detected.
  3. Hold the DST 5 to 10 cm from the IR-transmitter led of the set (in the FTV1.5E this led is located at the right side of the IR-receiver eye).
  4. Press the "OK" key.
     The error is represented by a 2 digit number. The 2 digits on the DST are displayed sequentially, with a pause before it is repeated. The digit after the pause is the 1st digit.
     If the display reads 4 - 7, the error code is 47. To read other error codes, press "DIAGNOSE" and one of the other digit keys.

Note:
- If the DST cannot communicate to the FTV1.5E in a proper way, ERROR 2 is shown in the display of the DST. Trying again by changing the DST position a little bit might often help.
- If the error buffer of FTV1.5E is empty, no errors are displayed by the DST. The display remains blank.

Clearing the error buffer
The error buffer can be cleared in 2 ways:

1. In the SAM by selecting the item RESET ERROR BUFFER in the main menu.
2. By the "DIAGNOSE 99" command of the DST (in all modes except the SAM). Press the DIAGNOSE key on the DST, followed by 9 and 9 and then <OK >.

Error code table
See paragraph 6.4



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8.1 Matching adjustments (e-box/display-box)

When should something be aligned?

If the display panel (8; figure 12-1) is exchanged, nothing.
If pdp-interface panel or an e-box is exchanged [small signal panel, to be precise the TDA4780 must be matched to the pdp-interface panel], both white-drive as black reference must be re-aligned.
Black alignment is done by 3 potentiometers (R:3329, G:3379, B:3429) on the pdp-interface panel.
Conditions:
The black picture can be generated by a service generator.
Set must warm-up for 10 minutes
Contrast-level to maximum & brightness-level to level 30 (in the middle)
Tint on 'cool'
Dynamic contrast 'off'
DNR 'off'.
The potentiometers first will be rotated to the left, then they will be adjusted accurately in such a way that no colour becomes visible. (So turn potentiometer from just colour, to no colour)
White-drive alignment will be settled via Service Alignment Mode. After selecting "white drive"l the following values have to be entered:

	Cool	Normal	Warm
R	10	23	47
G	09	22	36
B	63	63	63

8.2 Set settings via Service Alignment Mode

Alignments in the Service Alignment Menu; General

1. Enter this mode:

   Push <align>-button on the DST (RC7150), followed by password "3140" and <OK>-button.

2. Now the Service Menu is displayed on the screen. The next data becomes visible:
   - Software date ('Date') and version ('Id') of the Eprom e.g. 08-10-97 and Id: 3104 317 00900
   - Number of operating hours ('Operation Hours').
   - Content of the error buffer ('Errors') (the most recent failure is represented at top left side, directly behind 'ERRORS' indication.
   - The module that generated the defect. ('Defect. Module'). (In case more failures are in buffer, then 'Unknown' will be displayed. In case no failures 'None'.
   - Menu item 'Reset Error Buffer'. Via the< → >-button the error buffer can be erased.
   - Menu item 'Functional Test'. With the < → >-button all devices will be tested. Eventual defects will not be erased. The content re-appears when leaving 'Functional Test' again.
   - Menu item 'Alignments'. With this the Alignments sub-menu will be activated.
     The next settings can be selected:
     'General'
     - 'Adjustment of 'White Drive'
     - 'Adjustment Soft Clipper'
     - 'Adjust 'Peak White Limiter'
     - 'Input Level Stereo Decoder'
     - 'Stereo Channel Separation'
     - 'Luminance Delays'
     - 'PDP Test Pattern'.

     'Options'
     Set initialisation-codes of set via text
     'Option number':
     All options together, expressed in two long numbers. The original factory setting can be found at the back of the display box as well at the back of the e-box.
     'Store':
     Store of all alignments.

8.2.1 Detailed explanation sub-menus:

General

- When all alignments have been performed, 'STORE' must be activated to freeze value in permanent non volatile memory
- When option codes have been changed and stored, the mains switch of the set must be switched off and on to activate new configuration. (when switched off/on by Standby-command, the new option codes will not be read by main processor and the set will not operate as wished)
- When an empty NVM (non volatile memory) is detected, all settings will get pre-programmed factory default settings.
- In 'white-drive'-submenus a built in white field test pattern is available. Via 'TEST PATTERN ON/OFF' the pattern can be activated. The pattern only appears after selection specific white-D alignment.
- 'Adjust Soft Clipper': For the 'Soft Clipper' the default-value 63 can be set.
- 'Adjust Peak White Limiter': For the 'Peak White Limiter' the default-value 35 can be set.
- 'Input Level Stereo Decoder: Value between -4 and 5. Default: 0
- 'Stereo Channel Separation': Value between -24 and 25. Default: -4
- 'Luminance delay': With the "Luminance delay" alignments the luminance-information and the chrominance-information can be matched in time.
- The PAL-alignment is only active with PAL-signals and should be aligned with PAL-signals. (default: 10)
- The SECAM alignment is only active with SECAM signals and should be aligned with SECAM signals. (default: 11)
- The BYPASS alignment is only active with NTSC signals, when COMB-filter is on or with PALplus signals. This alignment can only be executed with this signals. (if the alignment for PALplus is correct, it is automatically also correct for NTSC with combfilter on and vice versa). (default: 9).
- As with other alignments, the changed settings should be followed by a 'STORE'-command.

Option menu
The options are divided in groups. Dependent of the hardware in the set, a certain configuration can be made. As this set only has limited configurations it is better to enter the HW-option number and SW-number. In this codes all information is covered. The chosen option code will lead to functions indicated with =>.

Menu name	Subjects	Options	Physically in the set
TV Systems	Frontend Type	=>FQ916(D)ME	Select frontend type (type number is on the frontend)
		FQ916MR	
		FV916MG	
		FQ936D	
		FS988	
		Chinese Tuner	
		FQ944D	
Stereo Decoder	Nicam Type	Not Available	No Nicam
		BG or I	Nicam with 2 IC's and 1 input filter
		BG and I	Nicam with 2 IC's and 2 input filters
		=>Eco Nicam	Nicam with 1 IC
	2 CS	=>Yes	TDA9840 present on SSP
		No	TDA9840 not present on SSP
	Global	Yes	Global sound decoder present
		=>No	Global sound decoder not present
Double Window	DW Available	=>Yes	DW module present
		No	DW module not present
	DW Version	=>Euro	European DW module
		USA	USA DW-module)
	PIP	Yes	
		=>No	
	Mosaic	=>Yes	
		No	
Teletext	TXT	Not available	-
		128 Kb	128 kB teletext memory
		=>512 Kb(400p)	512 kB teletext memory (1x514256)
		1 Mb (800p)	1 MB teletext memory (2x514256)
Communication	ESI	Yes	
		=>No	
	EACEM	=>Yes	
		No	
	Easylink	=>Yes	
		No	
Video Repro	Frame	Digital Scan	Full Feature - box present
		=>Natural Motion	Full Feature - box present + extra HW
		100/120 Hz	Eco feature box present
		50/60 Hz	No feature box present
	Combfilter	Not Present	No Comb filter present

Menu name	Subjects	Options	Physically in the set
		=>SAA4961	Comb filter with SAA4961
		MC 141625	Comb filter with MC 141625
	Dynamic Contrast	=>Yes	Smartic present
		No	Smartic not present
	Digital Panorama	=>Yes	Panic present
		No	Panic not present
	Auto Format FBX	=>Yes	algoritm activated
		No	algoritm not activated
Source Selection	SS Type	=>Euro AV3	Single-sided EURO I/O panel
	Euro AV3	None	No 3rd EURO connector (only with EURO I/O)
		=>Normal	3rd EURO connector present
Audio Repro	Basic		TDA9860 present on SSP
	Equalizer		AFU panel without Dolby
	=>Eq. + Dolby		AFU panel with Dolby
Digital Output	=>No		no digital output present
	Yes		digital output present (NICAM also present)

'Option number menu'
For FTV1.5E there are only 2 sets of settings valid:

Setting /12 models:
HW opt. 01280 14353 14783 27468
SW opt. 00006 07955

Setting /19 models:
HW opt. 01281 14353 14783 27468
SW opt. 00006 07955

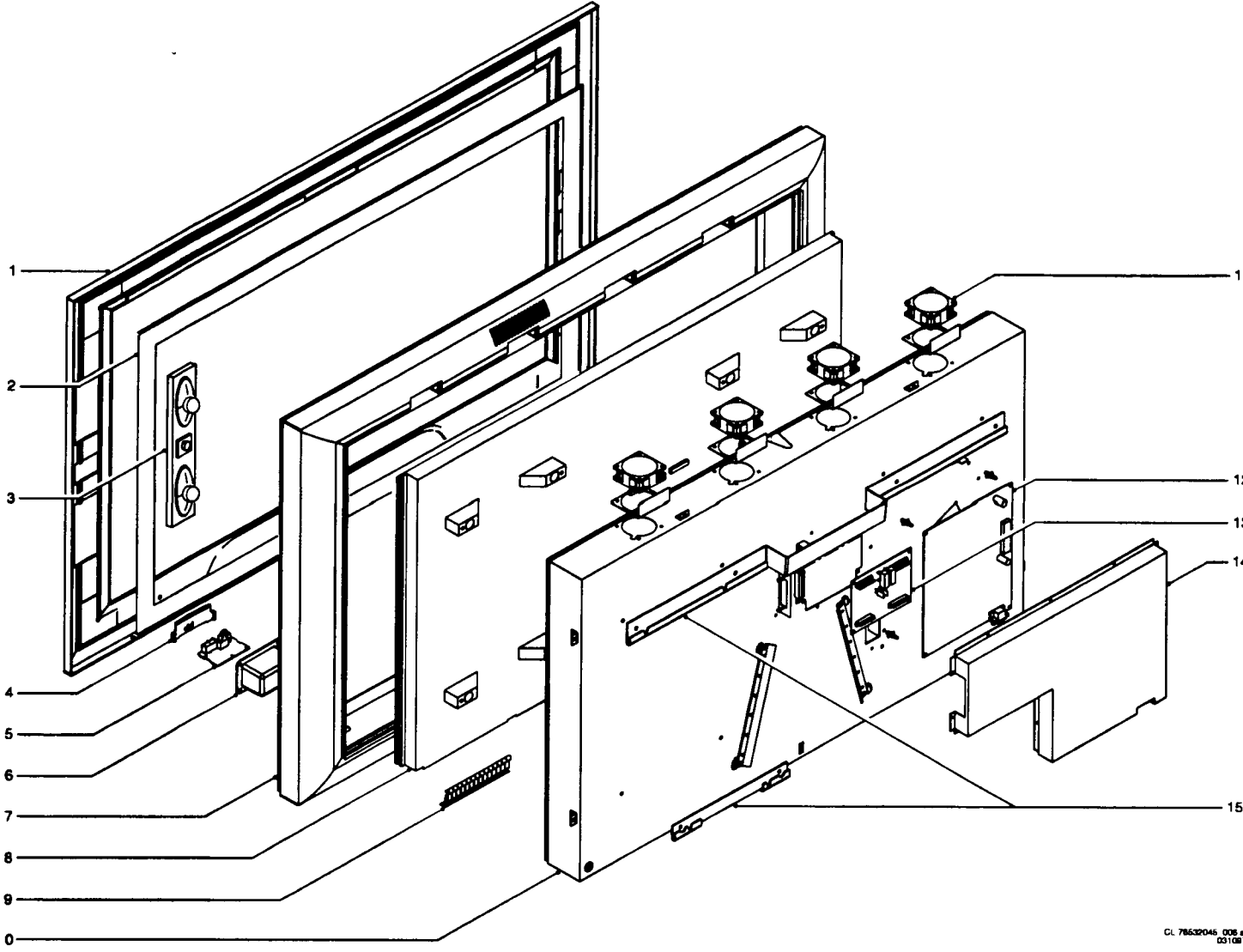

Figure 12-' Display box

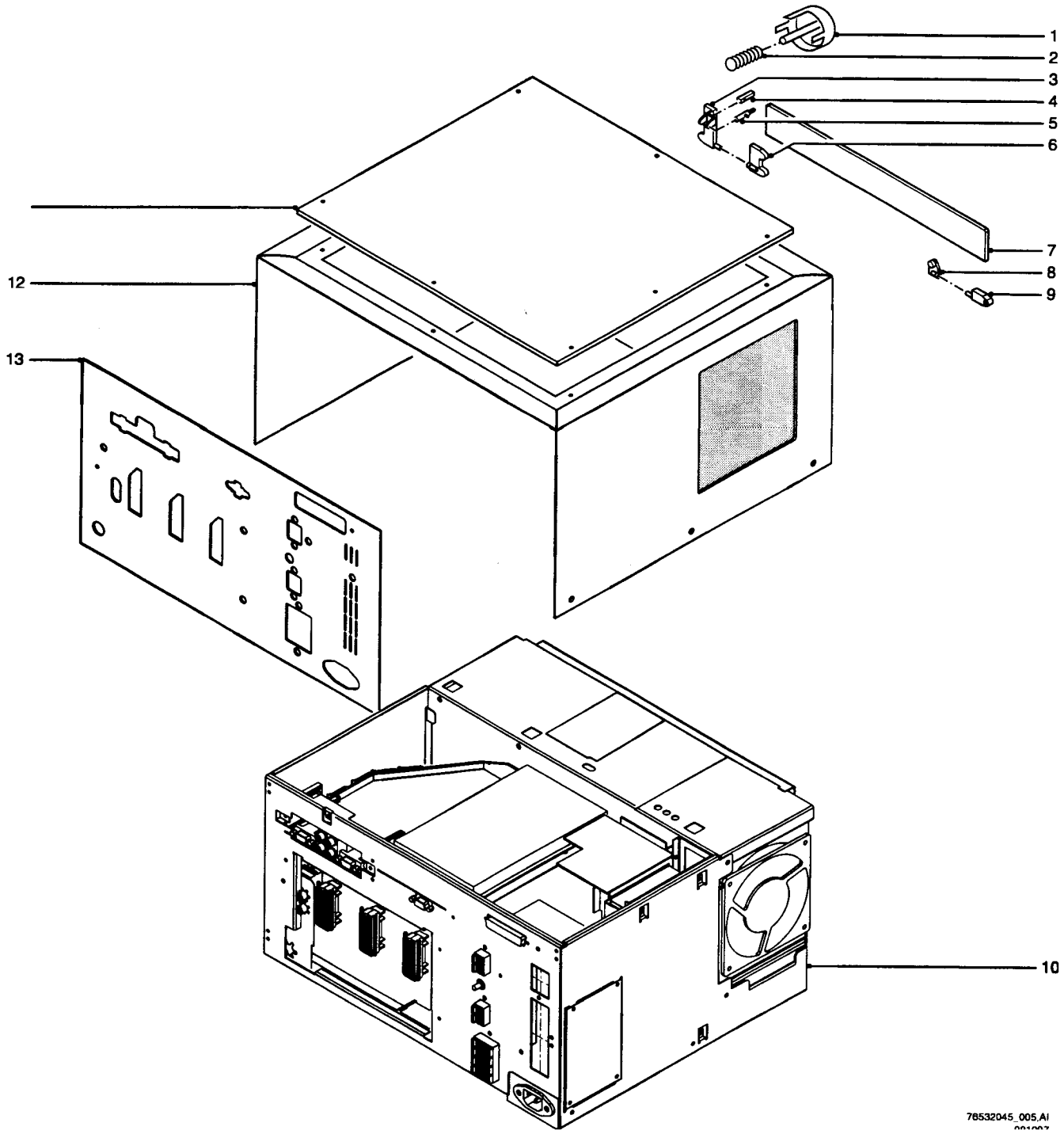

Figure 12-2; E-box

Exploded view display-box

1	4822 460 11103	Front Profile assy painted
2	4822 450 10397	Glass plate
3	4822 240 10253	Speaker plate FTV
4	4822 381 11912	Led lens
5	4822 212 11454	Led Panel Display
6	4822 441 12052	Led panel housing
7	4822 460 11104	Back profile assy painted
8(R)	4822 135 00146	Colour Plasma Display FPF42C10660UC-01
9	4822 492 11493	EMC Spring short
	4822 492 11492	EMC Spring long
	4822 402 10854	EMC Spring Z-shape
10	4822 442 01092	Back cover assy
11	4822 361 10689	Fan assy display
12(R)	4822 212 11459	Pdp Interface panel
13(R)	4822 212 11456	Pdp Discharge Panel
	4822 402 10853	Bracket fix glass plate

Exploded View E-box

1	4822 410 11401	Mains Knob
2	4822 492 52423	Spring Mains knob
3	4822 535 10507	Pivot push side
4	4822 417 50289	Locking Mechanism
5	4822 529 10305	Shock absorber air
6	4822 535 10506	Hinge push side
7	4822 443 10816	Door assy painted
8	4822 535 10508	Hinge
9	4822 535 10509	Pivot
10(R)	4822 310 11105	Inner E-box-/12
	4822 310 11106	Inner E-box-/19
11	4822 442 01093	Top Cover
12	4822 441 12051	Housing E-box
13	4822 442 01094	I/O cover E-box

Connecting material

1	4822 320 11091	Coaxial cable (absorption)
2	4822 320 12135	Display video cable (VGA-cable 3 meter)
3	4822 321 11355	Display power cable
6	4822 321 11356	Mains cord euro

Other parts

	4822 410 63802	Knob loudspeaker On/Off
	4822 526 10694	Ferrite core
	4822 526 10695	Ferrite Core split
	4822 219 10363	Remote Control RC8106/01
	4822 462 10981	Spacer for display box (wall)
	4822 445 10693	Loudspeaker box FB505 30W/6 ohm
	4822 445 10692	Subwoofer box assy

Service accessories

	4822 462 11011	Dealer Stand
	4822 218 21232	DST RC7150
	4822 263 50216	VGA/MAC plug adapter
	4822 462 10982	Foot E-box
	4822 263 21189	VGA interface block
	4822 901 10027	Test Software
	4822 900 11192	Set software